

# **TOWN OF DUNSTABLE**

## **BOARD OF WATER** **COMMISSIONERS**

Dunstable, MA

### **Rules and Regulations**

**Revised 2008**

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**BOARD OF WATER COMMISSIONERS**

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Rules and Regulations

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# **Town of Dunstable Board of Water Commissioners**

## **Rules and Regulations**

### **I. ADMINISTRATION**

#### **I.A. Authority:**

- I.A.1. The Town of Dunstable Board of Water Commissioners (BWC) was formed and operates under the Authority of Chapter 344 of the Special Acts of 1916.
- I.A.2. No representative of the BWC has the authority to change or modify said rules and the BWC will not recognize or be bound by any claimed change or modification hereof. The rules and regulations of the BWC may be altered or amended at the discretion of the BWC and shall form a part of the contract with every water taker and all persons taking water from the department shall be deemed to accede to and be bound thereby.
- I.A.3. All persons are forbidden to shut off water from any pipe or hydrant of the BWC without the approval of the BWC and no person without the written consent of the BWC, shall open a hydrant, for any purpose other than extinguishing a fire, except firemen at all reasonable periods for the purpose of practice, with prior permission of the superintendent.
- I.A.4. The BWC reserves the right to change or amend these rules and regulations, and make additions thereto or exceptions there from, at any time without advance notice and to establish and assess penalties for violations, including the right to suspend water service.
- I.A.5. Effective May through October of every year; the Town of Dunstable Water Department has a Bylaw in place to implement an odd/even voluntary water ban. Should conditions require, this conservation measure will become a mandatory ban as declared by the Board of Water Commissioners (BWC). Violations will be subject to a fine.
- I.A.6. For all fees see Appendix A – Schedule of Rates and Fees

I.B. Definitions:

Air Gap: The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood rim of said vessel.

Auxiliary Water Supply: Any water supply on or available to the premises other than the approved public potable water supply.

Backflow: The flow of water or other liquids, mixtures or substances under pressure into the distributing pipes of a potable water supply system from any source or sources other than its intended source.

Backflow Prevention Device: A device or means designed to prevent backflow or siphonage.

Back-Siphonage: The flow of water or other liquids, mixtures or substances into the distributing pipes of a potable water supply system from any source other than its intended source caused by the sudden reduction of pressure in the potable water supply system.

BWC: The Town of Dunstable Board of Water Commissioners. Here in abbreviated as “BWC”.

Consumer: The word “consumer” where used herein shall mean the person or entity actually using the water, whether owner, tenant, lessee, assignee or other.

Containment: The installation of any approved backflow prevention device at the water service connection to any customer’s premises, or the installation of an approved backflow prevention device on the service line leading to and supplying a portion of a customer’s water system where there are actual or potential cross-connections which cannot be effectively eliminated or controlled at the point of cross-connection.

Contamination: Means an impairment of the quality of the potable water by sewage, industrial fluids or waste liquids, compounds or other materials to a degree which creates an actual hazard to the public health through poisoning or through the spread of disease.

Cross-Connection: Any physical connection or arrangement of piping or fixtures between two otherwise separate piping systems one of which contains potable water and the other non-potable water or industrial fluids of questionable safety, through which, or because of which, back-flow or back-siphonage may occur into the potable water system.

Cross-Connection Controlled: A connection between a potable water system and a non-potable water system with an approved backflow prevention device properly installed that will continuously afford the protection commensurate with the degree of hazard.

Double Check Valve Assembly: An assembly of two independently operating approved check valves with tightly closing shut-off valves on each side of the check valves, plus properly located test cocks for the testing of each check valve.

Health Hazard: The term is derived from an evaluation of the potential risk to public health and the adverse effect of the hazard upon the potable water system.

Health Hazard (High Hazard): Any condition, device, or practice in the water supply system and its operation, which could create, or, in the judgment of the BWC, may create a danger to the health and well being of the water consumer.

Industrial Fluids System: Any system containing a fluid or solution which may be chemically, biologically or otherwise contaminated or polluted in a form or concentration such as would constitute a health, system, polytonal or plumbing hazard if introduced into an approved water supply.

Main: The pipe owned by the BWC, in a public right-of-way or easement used to convey water from one point in the water distribution system to another.

Occupant: One who has certain legal rights to or control over the premises occupied.

Plumbing Hazard (High Hazard): A plumbing type cross-connection in a consumer's potable water system that has not been properly protected by a vacuum breaker, air-gap separation, or backflow prevention device. Unprotected plumbing type cross-connections are considered to be a health hazard.

Pollution: Means the presence of any foreign substance (organic, inorganic, or biological) in water which tends to degrade its quality so as to constitute a hazard or impair the usefulness or quality of the water to a degree which does not create an actual hazard to the public health but which does adversely and unreasonably affect such waters for domestic use.

Pollutional Hazard (Low Hazard): An actual or potential threat to the physical properties of the water system or to the potability of the public or the consumer's potable water system but which would constitute a nuisance or be aesthetically objectionable or could cause damage to the system or its appurtenances, but would not be dangerous to health.

Pressure Vacuum Breaker: A device containing one or two independently operating loaded check valves and an independently operating loaded air inlet valve located on the discharge side of the check or checks.

Reduced Pressure Backflow Device: An assembly of two independently operating approved check valves with an automatically operating differential relief valve between the two check valves, tightly closing shut-off valves on either side of the check valves, plus properly located test cocks for the testing of the check and relief valves.

Service Area: The geographical area incorporated as the Town of Dunstable, MA, and any area outside of the Town of Dunstable in which water service is provided by the BWC under special agreement.

Service Line: A pipe and appurtenances used to convey water from a main to a consumer. The service line ends at the consumer's side of the meter.

Service: A service is a separate household of one or more people, stores, garages, laundries, or in the opinion of the BWC whatever constitutes a service shall pay a minimum charge in accordance with the rate schedule currently in effect as posted in the BWC Office, and listed in the Appendix A – Schedule of Rates and Fees.

Stand-by Fee: Fee charged to the owner of a parcel of land to which a service line has been extended from the main to the edge of the right-of-way or easement, from which service can be provided. Property owners with an active service account with the BWC will not be charged a stand-by fee.

Taker: The word “taker” where used herein shall mean the record owner of the premises supplied with water, without regard to use or occupation of the premises by him or it.

Water, Non-potable: Water from a source, which has been approved by the Massachusetts Water Supply and Pollution Control Commission for human consumption.

Water, Potable: Water which is not safe for human consumption or which is from a questionable source.

Water-Used: Any water supplied by a water purveyor the BWC from a public potable water system to a consumer's water system after it has passed through the point of delivery and is no longer under the sanitary control of the water purveyor BWC.

#### I.C. Service Agreement:

- I.C.1. The amount of all fees and rates are listed in Appendix A - Schedule of Rates and Fees of the BWC and is part of these Rules and Regulations.
- I.C.2. No Consumer or taker shall use or cause to be used any water from the distribution system operated by the BWC without a service agreement approved by the BWC or its agent.
- I.C.3. Application for service shall be made in writing on a service agreement form supplied by the BWC. The filing of an application for service shall signify the applicant's acceptance to abide by these rules and regulations and any amendments that shall be implemented by the BWC. Application for water must be made to the BWC and be signed by the taker to be supplied or by his duly authorized agent. He must state in writing, the use for which the services are required and no other use thereof shall be made. If application is made by an agent for the taker, a copy of the agent's authorization by the taker shall also be filed with the service agreement form.

I.D. Meters:

- I.D.1. Meters shall be installed and all service lines in a location provided by the taker and approved by the BWC.
- I.D.2. The BWC will furnish, install and/or supervise installations, seal and maintain all meters and remote readers. The taker will provide a readily accessible, adequate and proper space or housing, heated if necessary, to protect same from freezing. The cost of repair or replacement of seals, meters or remote readers, damaged by freezing, neglect, tampering or vandalism shall be paid by the taker. All metering equipment is and shall remain the property of the BWC.
- I.D.3. Meters, remote readers, and seals may not be removed except by or under the supervision of the BWC personnel. Only BWC personnel may remove or replace seals, which if broken may indicate the meter, has been tampered with.
- I.D.4. The BWC is not responsible for leaks past the curb stop. Water passing through a meter is considered to be consumed.
- I.D.5. The accuracy of the meter on any premise will be tested by the BWC upon written request of the taker, who shall pay in advance a fee, refer to Appendix A – Schedule of Rates and Fees, to cover the cost of the test. If, based on such a test the meter is found to register 2% more water or greater than actually passes through it, the meter will be repaired, the fee will be refunded and the water bill for the current period will be adjusted in accordance with the result of the test; if however, it appears the person

was charged or has paid for less water than he should have been charged with or should have paid for, he shall forthwith, be charged with the proper additional amount and shall pay the same, together with the expense of the examination and test, to the BWC.

Based on AWWA Standard ANSI/AWWA C700-90, all meters must be tested and/or repaired by agents or representatives of the BWC, fees according to Appendix A – Schedule of Rates and Fees, at the following intervals:

5/8"	–	every 10 years
1"	–	every 6 years
1-1/2" and up	–	every 4 years

- I.D.6. The consumer, taker, or occupant shall not permit access for any purpose whatsoever, except to authorized employees of the BWC, or other persons in authority, to the meter or interfere with it and shall provide for its safekeeping. In case of Loss or Damage to the meter by freezing or negligence of the consumer, taker, or occupant, the taker shall pay the BWC the value of such meter or the cost of the repairs plus labor costs.
- I.D.7. No person is allowed to furnish water to other person, families or business without the consent of the BWC. Any person violating this rule may be charged a full rate for each violation plus appropriate fees.
- I.D.8. No alteration shall be made to any service or equipment under the authority of the BWC, except by authorized agents of the BWC. No plumber, taker, consumer, or other person not authorized by the BWC shall attempt to shut off the supply of water at the curb stop without the express consent of the BWC.
- I.D.9. Agents or representatives of the BWC may enter the premises of customer at all reasonable times for the purpose of examining pipes, fixtures, or attachments. They may enter at all reasonable times to read or inspect meter.
- I.D.10. For those having outside recorders, the BWC will periodically read the inside meter to verify the accuracy of the outside recorder. In case of a discrepancy between the two readings, the inside meter reading will be considered the true reading, and the bill will be adjusted accordingly.
- I.D.11. Any person, who removes, changes, alters or damages any meter configuration will be liable for all damages. All meter configuration changes will be at the discretion of the BWC or appropriate designee.



- I.D.12. The DWD will be responsible for meters up to and including one (1) inch in size. Any meter over a one (1) inch size will be tested and maintained by the DWD, with any repair or replacement costs forwarded to the property owner. Failure to pay for repair costs will result in water service termination.
- I.D.13. On all main leaks, service leaks, hydrant repairs or installations, the DWD will backfill to the existing grade. The DWD will not be responsible for landscaping of any kind.
- I.D.14. The DWD will be responsible from the water main to the curb stop only. Any repairs or installations from the curb stop to the building will be the responsibility of the property owner. Any repairs or installations must be inspected by the DWD. The DWD will make all connections at the curb stop and will charge an hourly Inspection fee. For all new connections, the property owner or builder will be responsible for all roadway excavation, compaction and surface restoration. The DWD will make service taps as well as make a “hole hawg” available for a fee(s). The DWD will inspect all water related work. The Highway Department which requires a street opening permit will inspect all backfill compaction and pavement reconstruction.
- I.D.15. The DWD will be responsible for the cellar stop meter and outgoing meter connector only. Any leaks or problems after such point will be the owner’s responsibility, as well as any water charges incurred.
- I.D.16. Any leaks after the curb stop or meter (pit or otherwise) must be repaired within 72 hours of notification. All leaks and water charges after the curb stop or gate valve will be the responsibility of the homeowner(s). All repairs must be inspected by a DWD Employee before the water is turned on. The BWC is not responsible for leaks or repairs on private property. If any leak is causing safety issues or flooding problems, the homeowner will be required to repair leak immediately after notification.
- I.D.17. The BWC shall not in any way or under any circumstances be held liable or responsible to any person or persons for any loss of damage from any excess or deficiency in the system pressure, volume or supply of water due to any cause whatsoever. The BWC will undertake to use all reasonable care and diligence to avoid interruptions and fluctuations in the service, but cannot and does not guarantee that such will not occur.

I.E. Service Lines:

- I.E.1. The BWC is responsible for the installation and maintenance of service lines from the main to the discharge side of the curb stop. The taker is responsible for the installation of the service line from the curb stop to the

customer's side of the meter under the inspection of the BWC. Any increase in size, change in material or other modifications to the service line beyond the curb stop can only be made by the taker at his expense, after written request to and approval by the BWC.

- I.E.2. The BWC may at any time shut off water for the purpose of making repairs or changing its piping system or for any other necessary purpose; it may also shut off water upon the failure of the owner, taker or consumer or occupant to observe its rules and regulations. The BWC shall not be liable for any damage caused by so doing nor for any variation in pressure from any cause nor shall any taker be entitled to any discount or rebate for reason thereof. It is understood however, that wherever practicable the department shall give the takers and/or consumers notice of its intentions to shut off water. The BWC further reserves the right to restrict the use of water whenever the public exigency requires.
- I.E.3. The BWC may terminate any water source to any facility where cross-connections are maintained without the required backflow prevention devices, which have been approved by the BWC.
- I.E.4. If any service charge, fee or bill for water used, is not paid within 30 days of issuance, the BWC may file a lien on the property in accordance with M.G.L. Ch 40 or terminate service to the property. In either case written notice shall be sent to the taker by U.S. Postal Service registered first class mail return receipt, or by hand delivery by Constable. Fourteen days prior to filing the lien or shutting off of the water.

I.F. Non-Liability:

- I.F.1. The BWC does not guarantee the consumer a full volume of water or the required pressure per square inch necessary to effectively operate hydraulic elevators, sprinkler system or other appliances, or equipment the same being subject to all the variable conditions that may take place in the use of water from the main.
- I.F.2. No consumer shall be entitled to damages, or to have payment refunded, for any interruption of supply occasioned either by accident to any portion of the works, or by shutting off of water for the purpose of additions or repairs to the works, or by the stoppage or shortage of supply due to causes beyond the control of the BWC, including without limitation thereof, drought, earthquake, fire or flood.
- I.F.3. The BWC will not be responsible for damages caused by dirty water resulting from the opening or closing of any gate for repairs, the use of any hydrant, or the breaking of any pipe.

I.F.4. The BWC assumes no liability for conditions, which exist in consumer's pipes and cause trouble coincident to or following the repairs of any main pipe, service pipe, meter, or other appliance belonging to the BWC.

I.F.5. The BWC reserves the right at any time without notice to shut off the water in the main for the purpose of making repairs, extensions or for other necessary purposes. Persons having boilers or other appliances on the premises depending on the pressure in the pipes to keep them supplied with water are hereby cautioned against danger from these sources, and are required to provide at their own expense, suitable safety appliances to protect themselves against such danger. In any event, it is expressly stipulated that the BWC will not be liable for any damage resulting from water having been shut off, either through accident or necessity, but shall only be liable for injury or damage resulting from a failure to use reasonable care during such shut off.

I.G. Severability:

I.G.1. If any part of these rules and regulations are found to be unenforceable by a court of law, such findings shall not affect the remaining parts, which shall remain in full force and effect.

I.H. Cross-Connection Control Authority:

I.H.1. Under Public Law 93-523, the Safe Drinking Water Act of 1974, and Massachusetts Reg. 310 CMR, Section 22.22, Cross Connections Section 10, the BWC has the primary responsibility for preventing water from unapproved sources, or any other substances, from entering the public potable water system.

I.H.2. Purpose: The purpose of this regulation is:

I.H.2.1. To protect the public potable water supply of the area served by the BWC from the possibility of contamination or pollution by isolating within its customer's internal distribution system(s) or its customer's private water system(s) such contaminants or pollutants which could backflow or back-siphon into the public water supply system; and

I.H.2.2. To promote the elimination or control of existing cross-connections, actual or potential, between its customer's in-plant potable water system(s) and non-potable systems, plumbing fixtures and industrial piping systems; and

- I.H.2.3. To provide for the maintenance of a continuing program of cross-connection control which will systematically and effectively prevent the contamination or pollution of all potable water systems by cross-connection.

I.H.3. Responsibility:

- I.H.3.1. The BWC shall be responsible for the protection of the public potable water distribution system from contamination or pollution due to the backflow or back-siphonage of contaminants or pollutants through the water service connection. If in the judgment of the BWC an approved backflow prevention device is required, at the BWC water service connection to any taker's premises, for the safety of the water system, the Superintendent or his designated agent shall give notice in writing to said taker to install such an approved backflow prevention device at each service connection to his premises. The taker shall, within 30 days, install such approved device or devices at their own expense, and failure, refusal or inability on the part of the taker to install said device or devices within 30 days shall constitute a ground for discontinuing water service to the premises until such device or devices have been properly installed.

I.H.4. Water System:

- I.H.4.1. The water system shall be considered as made up of two parts: The BWC's system and the taker's system.
- I.H.4.2. The BWC's system shall consist of the source facilities and the distribution system; and shall include all those facilities of the water system under the complete control of the utility, up to the curb stop.
- I.H.4.3. The source shall include all components of the facilities utilized in the treatment, storage, and delivery of water to the distribution system.
- I.H.4.4. The distribution system shall include the network of conduits used for the delivery of water from the source to the taker's system.
- I.H.4.5. The taker's system shall include those parts of the facilities beyond the curb stop which are utilized in conveying delivered domestic water to points of use, except the meter and remote reader which shall remain the property of the BWC.

I.H.5. Policy:

- I.H.5.1. No water service connection to any premises shall be installed or maintained by the BWC unless the water supply is protected as required by Massachusetts State Law 310 CMR Section 22.22 and this Regulation. Service of water to any premises shall be discontinued by the BWC if a Backflow Prevention Device required by this Regulation is not installed, tested and maintained, or if it is found that a Backflow Prevention Device has been removed, bypassed, or if an unprotected cross-connection exists on the premises. Service will not be restored until such conditions or defects are corrected.
- I.H.5.2. The BWC system should be open for inspection at all reasonable times to authorized representatives of the BWC to determine whether cross-connections or other structural or sanitary hazards, including violations of this Regulation exist. When such a condition becomes known, the BWC may deny or immediately discontinue service to the premises by providing for a physical break in the service line until the taker has corrected the condition(s) in conformance with all statutes and regulations relating to plumbing and water supplies and the Regulations adopted pursuant thereto. All expenses relating to the disconnection and reconnection shall be at the taker's expense – refer to Appendix A – Schedule of Rates and Fees.
- I.H.5.3. An approved Backflow Prevention Device where required shall be installed at the takers expense on each service line to a taker's water system at or near the property line or immediately inside the building being served; but, in all cases, before the first branch line leading off the service line wherever the following conditions exist:
  - I.H.5.3.1. In the case of premises having an auxiliary water supply which is not or may not be of safe bacteriological or chemical quality and which is not acceptable as an additional source by the BWC, the public water system shall be protected against backflow from the premises by installing a Backflow Prevention Device in the service line appropriate to the degree of hazard. An exemption may be granted by the BWC only in the following conditions:
    - I.H.5.3.1.1. The only fixtures in the facility will be toilets and sinks.
    - I.H.5.3.1.2. The sinks will be used for normal domestic purposes only and have no hose connections or be threaded to accept hose connections.

- I.H.5.3.1.3. The facility will not have an industrial fluid system or pollution in its system.
- I.H.5.3.1.4. At the discretion of the BWC independent fire sprinkler systems may be waived as a hazard, which would prevent an exemption under this section.
- I.H.5.3.1.5. This exemption is not available for warehouses or storage facilities.
- I.H.5.3.2. In the case of premises on which any industrial fluids or any other objectionable substance is handled in such a fashion as to create an actual or potential hazard to the public water system, the public water system shall be protected against backflow from the premises by installing a Backflow Prevention Device in the service line, at the cost of the taker, appropriate to the degree of hazard.
- I.H.5.3.3. In case of premises having (1) internal cross-connection that cannot be permanently corrected and controlled, or (2) intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not dangerous cross-connections exist, the public water system shall be protected against backflow from the premises by installing a Backflow, at the cost of the taker, Prevention Device in the service line.
- I.H.5.4. The type of protective device required under these rules and regulations shall depend upon the degree of hazard, which exist as follows:
  - I.H.5.4.1. In the case of any premises where there is an auxiliary water supply; or
  - I.H.5.4.2. Where there is any material dangerous to health which is handled in a fashion as to create an actual or potential hazard to the public water system; or
  - I.H.5.4.3. Where there are “uncontrolled” cross-connections, either actual or potential, the public water system shall be protected by an approved air-gap separation or an approved reduced pressure principal backflow prevention device.
  - I.H.5.4.4. In the case of any premises where there is water or substance that would be objectionable but not hazardous to health, if

introduced into the public water system, the public water system shall be protected by an approved double check valve assembly.

I.H.5.4.5. In the case of any premises where, because of security requirements or other prohibitions or restrictions it is impossible or impractical to make a complete inplant cross-connections survey, the public water system shall be protected against backflow or back-siphonage from the premises by the installation of a Backflow Prevention Device in the service line. In this case, maximum protection will be required; that is, an approved air-gap separation or an approved reduced pressure principal Backflow Prevention Device shall be installed in each service to the premises.

I.H.5.5. Any Backflow Prevention Device required herein shall be of a model and size approved by the Superintendent. The term “approved Backflow Prevention Device” shall mean a device that is approved and acceptable to the Massachusetts Department of Environmental Protection.

I.H.5.6. It shall be the duty of the taker at any premise where Backflow Prevention Devices are installed to have certified inspections and operational tests made at least once per year as required under Massachusetts Regulations and these Regulations. The BWC will conduct testing on these devices twice a year. The owner of device shall be charged a fee for these tests. The BWC may have these tests performed by a designated representative.

In those instances where the BWC deems the hazard to be great enough they may require certified inspections at more frequent intervals. These inspections and tests shall be at the expense of the taker and shall be performed by the BWC personnel or by a certified tester approved by the Superintendent and approved by the State of Massachusetts. It shall be the duty of the Superintendent to see that these timely tests are made. The Superintendent shall notify the taker in advance when the tests are to be undertaken so that he or his representatives may witness the test if so desired. These devices shall be repaired, overhauled, or replaced at the expense of the whenever said devices are found to be defective. Records of such tests shall be kept by the Superintendent.

I.H.5.7. All presently installed Backflow Prevention Devices which do not meet the requirements of this section but were approved devices for the purposes described herein at the time of installation and which have been properly maintained, shall except for the inspection and

maintenance requirements, be excluded from the requirements of these rules so long as the Superintendent is assured that they will satisfactorily protect the utility system. Whenever the existing device is moved from the present location or requires more than minimum maintenance or when the Superintendent finds that the maintenance constitutes a hazard to health, the unit shall be replaced at the cost of the taker, by a Backflow Prevention Device meeting the requirements of this section.

- I.H.5.8. All industrial, commercial and agricultural establishments attached to the water system will be required to install at the service entrance and immediately downstream of the meter a Reduced Pressure Backflow Device.
- I.H.5.9. All decisions relating to determination of Backflow Prevention Devices will be made by the BWC. Failure to comply with any directive from this office will result in termination of service.
- I.H.5.10. All testing and/or maintenance performed on Backflow Prevention Devices by the BWC or its agent will be charged to the owner of the device.

## **II. MAIN EXTENSIONS**

### **II.A. General:**

This section contains the detail specifications for all major elements, which enter into the project and become a permanent part thereof. These specifications are intended to be so written that only materials of the best quality and grade will be furnished, that manufacturing procedures for the product be controlled with failure-preventative type processes, and that good workmanship will produce a first class product. The specifications are formulated to provide total performance of each product within the frame of its intended use and as such, every detail requirement of the control upgrading of another. The fact that individual specifications may fail to be sufficiently complete in some detail will not relieve the Contractor of full responsibility for providing material of high quality under the total performance concept and protect them adequately until incorporated into the system or structure. Material, which does not meet each requirement or does not meet the total performance concept due to an imbalance between individual requirements that make up the material system shall be considered as not fully acceptable, therefore rejectable, and as such may be rejected at that discretion of the BWC. Special conditions may arise on any project that are not covered in these specifications or that may require special handling. In case of such special



conditions, complete detail as to materials, method of construction, or other procedures shall be submitted to the BWC for their review and approval.

- II.A.1. Standard construction details are incorporated and made a part of these specifications and shall become a part of the standard requirements for utility line construction. The details are included in the back of these standard specifications.
- II.A.2. Where reference is made to a particular industry specifications (ASTM, etc.) it is hereby understood that reference is made to the latest specifications revision in effect.
- II.A.3. Any eligible person or corporation who desires public water supply to serve a new development in Dunstable, or is to be serviced by the Dunstable system, must first make a written request to the BWC, to verify they have the capacity to supply water.
- II.A.4. All costs associated with any approved system extension including but not limited to design, review, construction inspection, and testing shall be the responsibility of the applicant requesting approval.
- II.A.5. No new service or water main extension will be permitted from November 1<sup>st</sup> through April 1<sup>st</sup> except in such cases as the BWC deem emergencies.

#### II.B. Standards:

- II.B.1. Environmental Protection Agency and Massachusetts Department of Environmental Protection, the governing standards of these agencies will be followed when applicable.
- II.B.2. All water utility construction which is in the service area of BWC shall comply with the BWC Rules and Regulations.
- II.B.3. If a conflict arises between any of these standards, the strongest standard shall prevail

#### II.C. Extensions to Developments and Public Ways:

In the case of water service to property located on a private or public way or a way established pursuant to the Subdivision Control Law where in any such instance there is no existing water main, the applicants shall bear the entire cost of installing water mains from the point necessary to connect with an existing main pipe, together with related construction, so far as is necessary, in order to properly provide service connections to such properties, subject at all times to the paramount authority of the BWC to control and regulate the extension of

mains and water services in the Town of Dunstable. The location, size and kind of water facilities to be used shall conform to the BWC Rules and Regulations, and shall be installed in accordance with approved Plans and Specifications.

#### II.D. Plans and Specifications:

- II.D.1. Description: This section covers the requirements of submission to the BWC for plans and specifications in order to obtain approval for construction of facilities.

No main extension shall be approved for connection to the BWC system which was constructed prior to approval of construction plans by the BWC or which was not constructed in accordance with these requirements as a minimum. At the Engineer's option, the submission of construction plans for approval may be accompanied by a letter statement that materials and workmanship will be in accordance with these standards in lieu of submittal of specifications.

All plans, specifications, and construction procedures shall conform to the standards as established by the BWC. All plans and specifications shall be completed by a Professional Engineer registered in the Commonwealth of Massachusetts. Any deviation of work from approved plans must be approved in writing by the BWC.

- II.D.2. Preliminary Report: When requested by the BWC, the Engineer shall prepare and submit a preliminary engineering report prior to approval of construction plans. The report shall conform to accepted engineering criteria including, but not limited to, the expected demands and a detailed construction cost estimate.

- II.D.3. Construction Plans and Specifications: General: All plans shall be drawn to a scale suitable for adequately showing the facilities proposed except as stipulated herein. All elevations shall be based on NGVD 1929. Horizontal control shall be based on the Town's control network. The plans shall depict the entire project and show all property lines including land ties, existing and proposed utility lines, P.E. stamp, benchmark from which elevations were taken, and other pertinent information. North arrow shall be pointed toward the top or left hand side of the sheet. The scale of the plans shall be 1" = 40', or as otherwise approved by the BWC. All plans shall be 24" X 36".

#### II.E. Approval:

Three (3) sets of complete plans and three (3) sets of specifications and one (1) set of design data shall be furnished to the BWC for approval. Upon approval, one (1) set of plans and specifications will be marked approved, signed and

returned to the Engineer. If additional copies are required for submission, to other agencies, they must be submitted at this time.

#### II.F. Inspection and Layout:

II.F.1. Description: This section covers the requirements of general inspection and layout for the construction of utility facilities. For more specific information see scope of specification on construction, test and material.

#### II.F.2. General Supervision:

II.F.2.1. All utility facilities proposed shall be constructed under the general supervision of a Professional Engineer registered in the Commonwealth of Massachusetts. General supervision shall consist of, but not be limited to, periodic visits to the construction work to observe the progress and quality of the construction work and to determine if the work is proceeding in accordance with the approved plans and specifications and with the standards set forth by BWC.

II.F.2.2. Any defects, deficiencies, or irregularities in the work found by the engineer or reported by the inspector shall be reported to the BWC by the engineer. Such action, as deemed appropriate, shall be taken to correct such deficiencies and notification shall be made to the BWC.

II.F.2.3. The presence of an inspector or representative of the BWC on the job site will in no way excuse the engineer or contractor from performing the inspection, testing, supervision and reporting called for in these specifications.

II.F.3. Construction Layout: The layout and staking of the construction work shall be completed by trained and qualified survey personnel under the supervision of the engineer. Such layout and staking shall consist of alignment and grade stakes necessary to establish batter boards or grade lines necessary for use in attaining proper alignment and grade of the facilities.

II.F.3.1. No construction in a Subdivision shall start until the front property corners on each lot are marked.

#### II.G. Easements:

II.G.1. Description: This section covers the requirements of easements for the purpose of maintaining utility lines where the proposed lines will be on private property or where the lines would not be within public rights-of-way.

II.G.2. Water Line Easements: Where lines are not placed in public rights-of-way, a permanent easement shall be acquired for the BWC and dedicated for the purpose of maintaining the utility lines. The easement shall have a minimum width of 20' and remain unobstructed.

II.G.3. Filing of Easements: Easements shall be properly recorded and filed. A copy of all final recorded easements or subdivision plans as filed shall be furnished to BWC. Along with easement plans and grant of easement, all easements for lines shall be in favor of the BWC. Easements as shown on a recorded plan shall be considered as public easements and adequate for this purpose.

II.H. As- Built Drawings:

Within 30 days after completion of construction and if the extensions are accepted and before service is provided, the Developer shall furnish the BWC one set of reproducible As-Built Drawings prepared and certified correct by the Developer's engineer. These As-Built Drawings shall be in accordance with the standards established by the BWC and shall show complete details of the Installation of the Main and appurtenances as required by the BWC including, but not limited to:

II.H.1. The size, material, and location of the main with respect to property lines.

II.H.2. The size, make, and station location with respect to street corners of all valves and fire hydrants, manholes and clean outs,

II.H.3. The limits and location of any and all special encasements or backfill materials including average depth of cover at such location,

II.H.4. A detailed diagram of all special installations at utility, drainage, and roadway crossings,

II.H.5. Location of other utilities encountered,

II.H.6. Location, sizes and type of easements.

II.H.7. Location of all service line taps on the main with distance to nearest valve.

II.H.8. Swing ties to all curb stops from a minimum of three (3) permanent visible land marks.

## II.I. Final Inspection and Acceptance:

- II.I.1. Description: This section covers the requirements for final inspections and acceptance for water facilities upon completion of the project.
- II.I.2. Testing: Methods of testing are outlined in Section VI - TESTING, of these standard requirements. All tests shall be conducted in the presence of a representative of the BWC. Twenty-four hour's notice shall be given to BWC prior to commencing any tests.
- II.I.3. Final Inspection: Before utility extensions are accepted for maintenance and service connections to these extensions approved, a final inspection will be made at the written request of the engineer. A list of material and workmanship defects, if any, will be forwarded to the engineer. Defects noted and all other known defects must be corrected before acceptance.
- II.I.4. Warranty Bond: Upon completion of the project and after all defects have been corrected in accordance with the final inspection, a warranty bond in an amount equal to 100% of the construction cost shall be forwarded to the BWC. The warranty bond shall be for a period of one year from date of acceptance and shall cover all defects in materials and workmanship. The warranty bond shall be binding on the developer.
- II.I.5. Acceptance: No connection of customer facilities or other utilization of utility mains will be permitted by the BWC until a letter of acceptance is issued. The acceptance letter will not be issued until the following requirements are met:
  - II.I.5.1.1. Receipt of one reproducible copy of approved "As-Built" plans on stable base drafting film, and AutoCad R14 DWG, or higher, compatible file.
  - II.I.5.2. Satisfactory correction of all defects.
  - II.I.5.3. Receipt of warranty bond.
  - II.I.5.4. Receipt of all required easements and deeds.
- II.I.6. Inspection Before Expiration of Warranty Bond: An inspection will be made by the BWC before the expiration of the warranty bond. A list of any defects in material or workmanship found during this inspection will be forwarded to the developer's engineer and a claim filed with the bonding company. As soon as defects found during this inspection are corrected, the BWC will issue full acceptance of the project for maintenance.

- II.I.7. Use of Completed Portions: Portions of the project completed will not be allowed to be put into service without written approval from the BWC. Approval of the use of completed portions of the project will be granted only in the best interest of the BWC. Use of completed portions of an incomplete project does not constitute acceptance of the project by the BWC.

### **III. DESIGN CRITERIA**

- III.A. General: As a minimum, design and layout shall meet the requirements of the standards referred to in Section II.B – MAIN EXTENSIONS - Standards.

- III.B. Materials: Valves, fire hydrants and water line material and all other appurtenances shall conform to these types listed in Section IV - MATERIALS, of these specifications. Materials not specifically authorized in these specifications are forbidden for use in the BWC system unless approved in writing by the BWC.

- III.C. Line, Size and Pressure: The nominal working pressure in the system should be approximately 50 PSI and not less than 35 PSI. All water mains including those not designed to provide fire protection shall be sized by a hydraulic analysis based on flow demands and pressure requirements.

- III.C.1. Minimum Diameter: The minimum size of water mains providing fire protection and servicing fire hydrants shall be six (6) inch diameter for residential areas and eight (8) inch diameter for commercial areas. Larger mains will be required if necessary to allow the withdrawal of required fire flow while maintaining the minimum residential pressure of 20 PSI.

- III.C.2. Minimum Pressure: The system shall be designed to maintain a minimum pressure of 20 PSI at ground level at all points in the system under all conditions of flow.

- III.C.3. Flow Requirements: In sizing the distribution system water mains, the required design flow shall be the greater of maximum day and fire flow or peak hour.

#### **III.D. Minimum Fire Flow:**

Required Fire Flow (Single Family Dwelling Areas): Required fire flow for single family dwelling areas shall be 250 GPM. Fire flow for all other areas shall be based on the Insurance Service Organization requirements.

### III.E. System Layout:

- III.E.1. Grid System: All mains shall be interconnected to form a grid system. Interconnections between six (6) inch or smaller mains shall not be more than 1,200 feet apart unless so authorized by the BWC. When greater separation of interconnecting mains is necessary, larger diameter pipes will be used. If the installation of a “dead-end” main cannot be avoided, its dead end length shall not exceed 1,000 feet unless authorized by the BWC.
- III.E.2. Dead Ends: Dead end shall be minimized by looping the main whenever practical. No more than six (6) residential lots shall be serviced from a dead end main. When a dead end main cannot be eliminated, they shall be provided with a fire hydrant, at the end to be used for flushing purposes.
- III.E.3. Horizontal Location: Water mains shall be installed only in dedicated streets, utility easements, or public right-of-way. The main shall be placed a minimum of five (5) feet from the edge of the easement or as shown in the street cross-section of the Planning Board’s Subdivision Rules and Regulations.
- III.E.4. Minimum Cover: All water mains and service lines shall have a minimum of five (5) feet of cover from the top of the pipe to finished grade.
- III.E.5. Hydrant Location: Hydrants shall locate such that no residence or building shall be more than 500 feet from a hydrant, measured along a street or public right-of-way.
- III.E.6. Hydrant Lead: Each fire hydrant shall be connected to the main with a minimum diameter pipe of six (6) inches equipped with an auxiliary gate valve.
- III.E.7. Valves: Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than one block or 800-foot intervals or as directed by the BWC. All valves will be installed with a cast iron adjustable valve box, installed plum and centered over the valve.
- III.E.8. Service Lines: Minimum service line size is one (1) inch diameter.
  - III.E.8.1. The approximate location for service lines should be shown on the drawing submitted for approval with the actual location shown on the “as-built” drawing with the distance from the nearest valve.

III.E.8.2. No service line or meter shall be placed in a location that will increase the chance of it receiving damage or impair access for maintenance such as in driveways or near trees.

III.E.8.3. All service lines crossing pavement in the street shall be encased in a PVC sleeve.

## **IV. MATERIALS**

IV.A. General: This part of the specifications shall govern for all materials used in the construction of water distribution facilities under the jurisdiction of the BWC. Projects that would necessarily involve materials other than those included in this specification shall be subject to the approval of the BWC. Complete specifications covering all materials not included herein shall be submitted for approval. Any material used other than materials herein specified shall be of the kind and type normally used in the construction of water distribution facilities.

### **IV.B. Ductile Iron Pressure Pipe:**

IV.B.1. Ductile iron pipe shall be designed in accordance with AWWA Standard C150, latest revision, and manufactured in accordance with the latest revision of AWWA Standard C151.

IV.B.2. Thickness design of ductile iron pipe shall be in accordance with laying condition "Type 2" with a minimum of five (5) feet of cover, AWWA C150. Pipe shall be a minimum of thickness, Class 5. For larger diameters or deeper cover, special design shall be provided. Thickness design will also be based on a minimum working pressure of 200 PSI.

IV.B.3. Coating and Lining: All ductile iron pipes shall be bituminous coated outside and cement-mortar lined inside with seal coat all in accordance with AWWA Standard C104.

IV.B.4. Joints: Ductile iron pipe shall be push on or Mechanical Joint pipe, with rubber gasket conforming to AWWA Standard C111.

IV.B.5. Rejection: Ductile iron pipe may be rejected for failure to meet any of the requirements of this specification.

### **IV.C. Polyvinyl chloride (PVC) Pressure Pipe:**

IV.C.1. PVC pipe shall meet or exceed AWWA Standard C-900, latest revision, PVC pipe with cast iron outside dimensions. PVC water pipe shall be listed by Underwriters Laboratories. The rigid PVC pipe shall bear the



seal of approval (or “NSF” mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe. Laying lengths shall be 20 feet ± 1 inch.

IV.C.2. PVC pipe shall be made from NSF approved Class 12454-A or BPVC compound conforming to ASTM specification D1784 for polyvinyl chloride resin.

IV.C.3. Pipe shall be made in nominal sizes of 4, 6, 8, 10 and 12 inches and shall meet dimensions ratios (DR’s) and physical dimensions as shown in Table 1 – PVC Pressure Pipe.

**Table 1 - PVC PRESSURE PIPE**

Nominal Size (Inches)	O.D. * (Inches)	Class 150 (DR 18) Min. Wall Thickness (Inches)	Class 200 DR 14) Min. Wall Thickness (Inches)
4	4.800	0.267	0.343
6	6.900	0.383	0.493
8	9.050	0.503	0.646
10	11.100	0.617	---
12	13.200	0.733	---

IV.C.4. Joints: Joints for PVC pipe shall be rubber ring joints. Solvent-cement type joints are not acceptable. Pipe and fittings must be assembled with a non-toxic lubricant. Provisions must be made for contraction and expansion at each joint with a rubber ring, and an integral thickened bell as part of the joint.

IV.C.5. Rejection: PVC pipe may be rejected for failure to meet any of the requirements of this specification.

IV.D. Service Lines: Shall consist of the corporation cock or stop at the main, the tubing or pipe and the curb stop.

IV.D.1. Copper Service Line: All copper service line shall be domestic “Type K” soft annealed conforming to Standard Specification for Seamless Copper Water Tube, ASTM Designation B-88.

IV.D.2. Polybutylene Service Line: Polybutylene (PB) pipe shall be manufactured from polybutylene conforming to ASTM D2581, Type 11, Grade 1, Designation Code PB2110, for sizes ¾ inch to 2 inch.

IV.D.3. Pressure Rating: The pipe shall be capable of withstanding a minimum working pressure of 160 psi at 73.4°F. Pipe Dimensions and tolerances shall conform to ASTM D2666.

IV.D.4. As a minimum the pipe shall have the following markings applied at intervals specified in ASTM Standards:

IV.D.4.1. Nominal size

IV.D.4.2. ASTM Designation Code (PD2110)

IV.D.4.3. Manufacturer

IV.D.4.4. NSF (National Sanitation Foundation approval

IV.D.5. Service Lines Larger than 2 Inches: For service lines larger than two (2) inches in diameter, pipe approved for water mains shall be used.

#### IV.E. Fittings:

IV.E.1. Description: The different kinds of strengths of fittings used in water line construction, outlined in this section shall be used in the construction of water lines. The strength of the fittings used shall be based upon standard engineering design procedures and manufacturer or trade association recommendation, and the strength proposed shall be shown on the drawings. All fittings used in the construction of water lines shall be “Underwriters Laboratory” (UL) approved. All materials listed in this section shall be used for main extensions unless specifically authorized in writing by the BWC. All minimums are just suggested minimums and in no way relieve the engineer from performing the necessary calculations.

IV.E.2. Fittings for Ductile Iron Pipe: Fittings for ductile iron pipe shall be ductile iron fittings conforming to AWWA Standard C-110. Ductile iron fittings shall be coal tar coated outside and cement-mortar lined inside with a seal coat of bituminous material conforming to AWWA Standard C-104. Joints for cast iron fittings shall be mechanical or push on joints conforming to AWWA Standard C-111.

IV.E.3. Fittings for Polyvinyl Chloride (PVC) Pressure Pipe: Fittings for PVC pressure pipe shall conform to “Fittings for Ductile Iron Pipe” of these specifications.

#### IV.F. Brass Stops, Cocks, and Fittings for Water Works Service:

- IV.F.1. General: Stops, and Fittings furnished under these specifications shall be of the size and type specified, with all parts of brass, conforming to Alloy Number 4 A (ASTM Designation B 62) which has a nominal composition of 85% copper and 5% each of tin, lead, and zinc, plus or minus 1%, except cast solder-joint fittings shall conform to ASTM B145, 4 B brass. All stops, cocks, and fittings shall be full size openings throughout, of the size specified.

All castings shall be smooth, free from burrs, scales, blisters, sand holes and defects of every nature, which would make them unfit for the use for which they are intended.

Nuts shall be smooth cast, with symmetrical hexagonal wrench flats.

- IV.F.2. Physicals: Brass used shall have a tensile strength (as determined from test bars) of not less than 30,000 psi, when tested as prescribed by ASTM B 208.

Fittings shall be designed for 200 psi working pressure, and when subjected to hydrostatic test pressures  $1\frac{1}{2}$  times working pressure or when subjected to a minimum of 85 psi air pressure while submerged in water shall not leak, top or bottom, and shall not show signs of structural failure.

Stops and cocks containing brass to brass parts shall be shipped prelubricated with a light, fluid lubricant between key and body. Lubricant shall remain fluid indefinitely, either in storage or in service.

- IV.F.3. Design Features of Stops and Cocks: Seating surfaces of the ground key type shall be tapered and shall be accurately fitted together by turning the key and reaming the body. Seating surfaces shall be lapped together using suitable abrasives to insure accurate fit. The large end of the tapered surface of the key shall be reduced in diameter for a distance that will bring the largest end of the seating surface of the key into the largest diameter of the seating surface of the body and the taper seat in the body shall be relieved on the small end, so that the small end of the key may extend through, to prevent wearing of a shoulder and to facilitate proper seating of the key. The stem end of the key, key nut, and washer shall be so designed that if the key nut be tightened to failure point, the stem end of the key shall not fracture. The nut and the stem shall withstand a torque on the nut of at least three times the necessary effort to properly seat the key without failure in any manner.

The ball stop shall have a full size round way opening with straight-through flow, Teflon coated, bronze ball with a minimum of 0.5 mil thickness coating. The stop must be so constructed that it may be disassembled and the ball removed without special tools.

Plug type stop shall have a full size round way opening with straight-through flow. Seating surfaces shall be brass (or teflon coated brass) to rubber "O" rings, providing positive pressure seal without mechanical means. The stop must be so constructed that the plug may be removed without special tools. Material for rubber "O" rings should conform to requirements of ASTM Specification D-2000-63T.

Inlet and outlet threads, of the types specified, shall conform to the applicable tables of AWWA C 800, and inlet threads shall be protected in shipment by a plastic coating or other equally satisfactory means. If used, coupling nuts shall have a bearing skirt machined to fit the outside diameter of the pipe for a length at least equal to the outside diameter of the pipe.

Corporation stops shall be so designed as to rotate about the axis of the flow passageway within a circle of rotation small enough to properly clear the inside of any standard tapping machine of appropriate size.

The brass curb stops shall be female iron pipe thread on the outlet and flared copper pipe or female iron pipe thread on inlet, as specified.

Corporation stops shall be of two types, Standard and Special. The Standard shall be flared copper pipe on outlet side and male Mueller thread or male iron pipe thread on inlet side, as specified. The Special type shall have a straight male end grooved to be inserted into a rubber or plastic sealing sleeve which is inserted into a smooth tap in the water main. This type should be used where soil corrosion is a factor.

#### IV.F.4. Design Features of Fitting:

IV.F.4.1. Flare-joint fittings shall be smooth cast, and shall have full size water-way throughout. Seating surfaces for metal-to-metal seal shall be machined to proper taper or curve, free from any pits or protrusions. Wrench flats shall be symmetrical hexagonal.

IV.F.4.2. All threaded fittings, of all types, shall have N.P. T. threads, and male threaded ends shall be protected in shipment by a plastic coating or other equally satisfactory means.

#### IV.G. Fire Hydrants:

IV.G.1. General: All fire hydrants shall comply with AWWA Standard C502.

IV.G.2. Valves and Nozzles:

IV.G.2.1. All fire hydrants shall be traffic model with 5¼ inch valve opening with two 2½ inch hose nozzle and one 4½ inch pumper nozzle, all national standard threads. They shall have 1½ inch Pentagon operating nut, open left (counter clockwise), with 6 inch Mechanical Joint show such as Mueller A-24012, A-24015, or approved equal.

IV.G.2.2. All fire hydrants shall be of such design as will permit their extension without excavating in case of future grade changes.

IV.H. Valves:

IV.H.1. General: Gate valves shall conform to American Water Works Association Specification C500. Valves shall be designed for a minimum water working pressure of 200 P.S.I. Gate valves shall have a clear waterway equal to the full nominal diameter of the valve and shall have a square operating nut and shall be opened by turning to the left (counter clockwise). Each valve shall have the maker's initials, pressure rating, and year in which manufactured cast in the body.

IV.H.2. Resilient seated gate valves shall be manufactured and tested to the requirements of AWWA C-509-87 and C-509-86 as applicable for a design working pressure of 200 P.S.I. This pressure rating shall be cast on the outside of the valve.

IV.H.3. Valve body, bonnet and gate shall be Ductile Iron, conforming to ASTM A-536. Shell thickness of body and bonnet components shall conform to Table 2 Sec. 4.4 AWWA C—509. So-called "Thinwall" valves, not included in this Standard, are not allowed.

IV.H.4. Valve body and bonnet shall be coated on all exterior and interior surfaces with a fusion bonded epoxy conforming to the requirements of AWWA Standard for Protective Epoxy Interior Coatings for Valves and Hydrants; C-550-90. Manufacturer shall certify that the coating will conform to following sections of the Standard:

IV.H.4.1. Section 2-Materials. (Relating to the suitability of the coating for use in a potable water system).

IV.H.4.2. Section 4-Tested and inspection. (Relating to qualification and production testing).

IV.H.5. The valve shall be designed so that during operation, or cycling of the valve, there is no friction or abrasion or rubbing together of the gate and body that can wear away any rubber or epoxy and expose bare iron. Valve manufacturer shall provide evidence from an independent testing laboratory that its valve can operate through 1000 cycles of operation at 250 P.S.I. unbalanced closing pressure and flow to open discharge without causing damage to the epoxy coating in body and gate and/or rubber coating on gate.

IV.H.6. Gate shall be covered with rubber over all interior and exterior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part which houses the stem nut. The stem hole through the gate shall be full opening top to bottom, and shall also be covered with rubber.

IV.H.7. "O" ring stem seal shall be replaceable with the valve under pressure in the full-open position.

IV.H.8. Valve body shall be furnished with factory installed stainless steel bolts.

IV.I. Valve Boxes:

Valves buried in the ground shall be provided with cast-iron valve boxes of proper dimensions to fit over the valve bonnets and to extend to such elevation at or slightly above the finished ground line as directed by the engineer. Tops shall be complete with covers and shall be adjustable. Valve boxes shall be set vertical and concentric with the valve stem. Covers shall have the word water plainly cast into the top surface.

IV.J. Tapping Valves and Tapping Sleeves:

IV.J.1. Tapping Valves: Tapping valves shall conform to the requirements of AWWA Standard C-500 with the following exceptions:

IV.J.1.1. Tapping valves shall have oversize seat rings to permit entry of standard tapping machine cutters.

IV.J.1.2. In the open position, valve gates shall be clear of the ports, so that cutter will pass through without making contact with the gates.

IV.J.1.3. Valves shall have an inlet flange conforming to ASA B 16. 1, Class 125, with a machined projection or recess to mate with Tapping Sleeve outlet flange to assure correct alignment.

IV.J.1.4. Valves shall have standard mechanical joint outlet end and shall fit any standard tapping machine.

IV.J.2. Tapping Sleeves:

- IV.J.2.1. Tapping sleeves shall be of 21/45 strength cast iron or Grade 60-40-18 ductile iron in two sections, the halves to be bolted together.
- IV.J.2.2. Branch outlet of tapping sleeve shall be flanged, with a machined projection on recess to mate with Tapping Valve inlet flange to assure correct alignment.

IV.K. Air Valves:

IV.K.1. Description: Air Valves shall be of two types as follows:

- IV.K.1.1. An Air Valve called for on the plans shall mean an Air and Vacuum Valve of the ball type designed to permit the escape of air from a pipeline when the line is being filled and to permit air to enter the pipeline when the line is being emptied.
- IV.K.1.2. A Combination Air Valve called for on the plans shall mean a combination Air and Vacuum and Air Release Valve designed to fulfill the functions of an Air and Vacuum Valve and also designed to permit the escape of air accumulated in the line at the high point when the line is under pressure while in operation. The valve shall be self-contained in one unit, not a combination of two valves.

IV.K.2. Materials: The valves shall be iron body, bronze fulcrum levers and links, stainless steel ball floats and pines, steel flange bolts and nuts, Buna-N synthetic rubber seats against bronze or stainless steel, and brass for other parts.

IV.K.3. Inlets and Outlets: Inlets shall be threaded for 2" and smaller and flanged for 3" and larger. Outlets shall be threaded through 4". Larger outlets shall be covered with a protective head.

IV.K.4. Operating Pressure & Tests: The Valves shall be designed to operate under an operating pressure of 150 psi and shall be tested to twice that pressure.

IV.L. Meters:

- IV.L.1. Description: This section covers water meters 5/8 inch to 2 inches. A special detail will be submitted for approval for meters larger than (2) inches.

- IV.L.2. Disc meters shall be Neptune T-10 or approved equal. Meter bodies shall be bronze with thermoplastic measuring chamber. Register shall be hermetically sealed with tamper proof seal. Meter shall be provided with a flow indicator and register in gallons.
- IV.L.3. Meter shall be furnished with Read-O-Matic remote register. Remote register shall be self-powered and transmit an 8-Volt pulse through a wire from the meter to a solenoid in the outside register. The register shall advance one unit of measure for each pulse received. The units shall be gallons.
- IV.L.4 All residential meters shall be furnished with dual check valve backflow prevention devices installed before the meter. The valves shall be machined brass constructed in a maximum pressure rating of 150 psi, meeting the requirements of ANSI / ASSE 1024, latest revision. Residential dual check backflow prevention devices shall be Watts No. 7 or approved equal.
- IV.M. Encasement Pipe:
- IV.M.1. Reinforced Concrete Pipe: Concrete encasement pipe shall be Class III reinforced concrete pipe, and shall be in accordance with ASTM C76 specifications.
- IV.M.2. Welded Steel Pipe: Welded steel pipe shall be a minimum of 0.250 wall thickness. Welded steel pipe shall be bituminous coated inside and out.
- IV.M.3. Corrugated Galvanized Metal Pipe: The pipe shall be fabricated from U.S. Standard 10 gage corrugated metal sheets. The base metal and fabrication shall be in accordance with A.R.E.A. Specification for Corrugated Metal Culverts.
- The corrugated metal pipe shall be bituminous coated inside and out.
- IV.M.4. PVC Encasement Pipe: PVC encasement pipe shall be used only when directed by the BWC, except for encasement of service lines. PVC encasement pipe shall be of a kind normally used for water distribution of the size necessary to encase the particular service line. Size shall be shown on the plans.
- IV.N. Pipe Bedding and Backfill:
- IV.N.1. Description: This section covers materials used for pipe bedding and backfilling. All water line bedding shall be Class "2" unless otherwise specified herein or shown on the plans. Class "1" bedding may be used for ductile only, unless approved by the BWC prior to construction.



#### IV.N.2. Bedding:

- IV.N.2.1. Class “1” Bedding: Class “1” bedding materials are materials on the site, earth bedding.
- IV.N.2.2. Class “2” Bedding: Class “2” bedding materials shall be composed of gravel materials. Gravel bedding materials shall be pea gravel or washed gravel no larger ½” diameter. Substitution of alternate bedding materials will be approved only in individual cases and only at the specific request of the engineer.
- IV.N.2.3. Class “3” and Class “4” Bedding: Class “3” and Class “4” bedding materials shall be composed of concrete and reinforcing steel. All concrete used for Class “3” and Class “4” bedding shall be 2,000 lb. concrete.

#### IV.N.3. Backfill

- IV.N.3.1. Standard backfilling shall be done with good earth, sand or gravel and shall be free from large rocks or hard lumpy material, unless the rocks or lumps are not more than approximately four (4) inches in greatest diameter and are scattered in the soil. No material of a perishable, spongy, or otherwise unsuitable nature shall be used in backfilling.
- IV.N.3.2. Granular Backfill: Shall conform to the following:

<u>Sieve Designation</u>	<u>Percent Passing</u>
½ inch	50 – 85
No. 4	40 – 75
No. 50	8 – 28
No. 200	0 – 10

With maximum stone size one (1) inch.

- IV.N.3.3. Controlled Density Fill. Controlled Density Fill (CDF) material is a flowable, self-consolidating, rigid setting, low density material that can substitute for compacted gravel for backfills, fills and structural fills. There are two main categories of CDF’s, excavatable and non-excavatable with a subcategory of flowable and very flowable. It shall be a mixture of portland cement, flyash (if very flowable), sand and water designed to provide strengths within the range specified.

IV.N.3.3.1. The categories of CDF's are:

- Type 1 Very Flowable (Non-Excavatable)
- Type 1E Very Flowable (Excavatable)
- Type 2 Flowable (Non-Excavatable)
- Type 2E Flowable (Excavatable)

The Very Flowable mixes (Type 1 and 1E) shall contain a minimum of 230 pounds of Class F Fly Ash or high air (25% plus) and will be self-leveling. Excavatable mixes (Type 1E and 2E) shall be hand tool excavatable.

Type 1 mixes are intended for permanent installations such as structural fills under structures. It has very flowable characteristics needed for distances and small areas. This type of mix should not be used as a bedding material. It is used to fill small hard-to-reach areas.

Type 1E mixes are excavatable material designed to have very flowable characteristics needed for filling small or far areas that later may need to be removed.

Type 2 mixes are used in areas where size and distance do not need the very flowable characteristic. It is intended for permanent installations such as thick fills under structures.

Type 2E mixes are excavatable mixes where size and distance of the installation do not require the flowable characteristics of a Type 1E mix.

IV.N.3.3.2. CDF is to be batched at a ready mix plant and is to be used at a high or very high slump of approximately 10 inches to 12 inches. It shall be flowable, require no vibration and after it has been placed can, for Types 1E and 2E, be excavatable by hand tools and/or small machines.

The ingredients shall comply with the following:

- |                                |                                      |
|--------------------------------|--------------------------------------|
| • Portland Cement              | AASHTO M 85                          |
| • Fly Ash                      | AASHTO M 295 Class F                 |
| • Sand                         | M4.02.02 Mass Highway<br>DEOT Specs. |
| • Air Entraining<br>Admixtures | M4.02.05 Mass Highway<br>DEOT Specs. |

IV.N.3.3.2.1. In lieu of the slump test, a 6-inch long, 3" diameter tube may be filled to the top and then slowly raised. The diameter of the resulting "pancake" may be measured and the range of the diameter shall be 9 inches to 14 inches.

IV.N.3.3.2.2. The maximum strength for structural flowable fills may be expressed in increments of 100 psf and will depend on the engineer's requirements.

IV.N.3.3.2.3. High air (25% plus) may be used instead of fly ash with an adjustment in sand content.

#### IV.O. Tape:

IV.O.1. Detectable Tracer Tape: The tape shall be a minimum of three (3") inches wide. The upper face of the tape shall be of a highly visible color easily detectable when exposed by digging. The upper face shall carry the warning of the buried water main below. The tape shall have a metallic backing in order that it may be traced by metal or pipe locators. It shall be used over all non-metallic pipes.

### **V. CONSTRUCTION**

V.A. General: This part of the specification shall govern the construction procedures used in the installation of water line facilities under the jurisdiction of the BWC. Complete specifications covering any unusual or special construction procedures shall be submitted for approval and approval must be received prior to beginning any construction operations.

V.B. Excavation: This section covers the excavation of water lines, and appurtenances.

#### V.B.1. Trench Excavation:

V.B.1.1. The sides of the excavation shall be cut at such a slope that will prevent caving. In areas where soil conditions permit normal excavation of the trench, the sides shall be cut as nearly vertical as possible from the bottom of the trench to a point twelve (12") inches above the top of the pipe when it is laid to grade. Maximum and minimum widths of the trench shall be as shown in the plans.

V.B.1.2. In caving ground or in wet, saturated, or flowing materials, the sides of the excavation shall be adequately sheeted and braced so as to maintain the excavation free from slides or cave-ins and safe for

workmen. Sheeting and shoring shall not be removed until the excavation has been backfilled to a sufficient depth to prevent caving.

V.B.1.3. The trench width from the bottom of the trench to an elevation twelve (12") inches above the top of the pipe shall not exceed the maximum width as specified in the plans.

V.B.2. Trench Bottom: The entire length of the water line shall be founded on bedding specified in Section Pipe Bedding and in Section Pipe Bedding and Backfill Materials.

V.B.3. Excavation for Fire Hydrants: Excavation for fire hydrants shall be as specified in Section Fire Hydrants.

V.B.4. Disposal of Excavated Materials: Excavated material shall be piled adjacent to the work to be used for backfilling as required. Excavated materials which are unsuitable for backfilling and excess material shall be disposed of in a manner approved by the engineer.

V.B.5. Use of Explosives: In the event the use of explosives is necessary for the efficient prosecution of the work, the contractor shall notify the engineer in advance of their use and shall exercise every precaution to prevent damage to adjoining improvements or property by reason of their use. Any damage to private property resulting from the use of explosives shall be the liability of the contractor. In all cases where the explosives are necessary, a permit from the Fire Department shall be obtained prior to their use.

V.C. Backfilling: This section covers backfilling of water lines and appurtenances.

V.C.1. Water Lines:

V.C.1.1. Backfilling of water lines shall include the refilling and consolidation of the fill in the excavation up to the surrounding ground surface or road grade at crossings. It is essential that the complete backfill be done in such a manner to minimize voids in the backfill.

V.C.1.2. Backfilling up to a point twelve (12") inches above the top of the pipe shall be done with granular backfill material and shall be free from large rocks or hard lumpy materials over one (1") inch in size. No materials of perishable, spongy, or otherwise unsuitable nature shall be used in backfilling.

V.C.1.3. Pipe shall be backfilled with granular materials of the proper moisture content to obtain a support under the lower ½ of the pipe, compacted to a density of 95% AASHTO T-99 modified or better. The intent is to cradle the pipe so that the full length of each joint is uniformly supported on firm bedding and the weight of pipe and fill is borne uniformly by the lower ½ of the pipe barrel. Tamping of fill below the spring line of the pipe may be by hand tamps provided the required density is obtained.

V.C.1.4. Where trenches are not under existing or proposed paved areas, backfill shall proceed with the same granular materials hand placed to a point twelve (12”) inches over the top of the pipe. Backfill may then proceed by whatever commonly used construction methods as are consistent with the integrity of the pipeline. Backfill outside the existing or proposed paved areas shall be left slightly over full to allow for settlement.

V.C.1.5. Where trenches are under existing or proposed paved areas, the entire trench up to a point two (2) feet below existing or proposed subgrade shall be backfilled with granular materials and compacted to a density of 95% AASHTO T-99 modified or better

The backfill of materials in trenches under existing or proposed paved areas shall be compacted with mechanical devices manufactured for that purpose from two feet above the top of the pipe to the top of the existing or proposed subgrade.

V.C.2. Fire Hydrants:

V.C.2.1. Backfilling of fire hydrants is specified in Section V.H. - CONSTRUCTION – Fire Hydrants.

V.A. Installation:

This section covers construction methods for pipe installation. All pipe shall be laid on either Class “2”, Class “3”, or Class “4” bedding materials as specified in Section IV.N.2, “Bedding”, except that ductile iron pipe conforming to Section IV.B, “Ductile Iron Pressure Pipe of these specifications may be bedded as specified for “Type 1” laying conditions in ANSI A21.50, “Thickness Design of Ductile Pipe,” latest revision, unless structural or foundation requirements indicate otherwise.

V.A.1. Class “1” Bedding:

- V.A.1.1. Class “1” bedding shall be completed in accordance with details shown on the standard details and with these specifications.
- V.A.1.2. The pipe shall be embedded in the bottom of the trench as shown on the standard details, with cuts made for the bells of the pipe.

V.A.2. Class “2” Bedding:

- V.A.2.1. Class “2” bedding shall be completed in accordance with details shown on the standard details and with these specifications.
- V.A.2.2. Excavation shall be carried to a depth of 0.4 feet below the bottom of the pipe. Where excavation is carried below this depth for any reason, the space shall be filled with Class “2” bedding material unless otherwise approved.
- V.A.2.3. The pipe and joints shall be embedded in the gravel or sand bedding material to a depth of 0.1 feet of the outside diameter of the pipe or to a minimum depth of 0.2 feet as shown on the standard details.

V.A.3. Class “3” and Class “4” Bedding:

- V.A.3.1. Class “3” and Class “4” bedding shall be completed in accordance with details shown on the standard details and with these specifications.
- V.A.3.2. Excavation shall be carried to the bottom of the concrete as shown on the standard details. Where excavation is carried to a depth below the bottom of the concrete for any reason, the space may be filled with either Class “2”, Class “3”, or Class “4” bedding material unless otherwise approved.
- V.A.3.3. Where Class “3” or Class “4” bedding is used, the pipe and pipe joints shall be embedded in the concrete as shown on the standard details.

V.A.4. Pipe Handling and Cutting:

- V.A.4.1. If authorized, cutting of the pipe shall be done so that the cut is square and clean, without causing damage to the pipe lining. Unless otherwise authorized by the BWC, all pipe cutting shall be done by means of an approved type of power cutter. The use of hammer and chisel, or any other method that results in rough edges, chips and damaged pipe, is prohibited. All cut edges shall be field beveled by use of a power grinder, as required, prior to installation.

- V.A.4.2. Each pipe section shall be placed into position in the trench in such manner and by such means required to cause no damage to the pipe, person or to property.
- V.A.4.3. The Contractor shall furnish slings, straps and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from delivery areas to the trench shall be restricted to operations that can cause no damage to the pipe units.
- V.A.4.4. Pipe shall not be dropped from trucks onto the ground or into the trench.
- V.A.4.5. The Contractor shall have on the job site, with each laying crew, all the proper tools to handle and cut the pipe.
- V.A.4.6. Damaged pipe coating and/or lining shall be restored before installation only as approved or directed by the BWC.

V.A.5. Service Lines:

- V.A.5.1. The bedding service lines shall meet with the requirements of Class “1” bedding set forth above.

V.B. Pipe Laying:

- V.B.1. Inspection: Each joint of pipe shall be inspected carefully before being placed in the trench. Any joint found to be cracked or otherwise so damaged as to impair its usefulness shall be plainly marked in such a manner that the marking will not rub or wash off. Damaged joints shall be removed from the site as soon as feasible.

V.B.2. Pipe Laying:

- V.B.2.1. All pipe and fittings shall be installed to the line and grade as detailed on the plans. Subject to the approval of the BWC, other fittings may be added to or substituted for those shown on the plans, should the need arise during construction. This permissive stipulation in no way shall relieve the Contractor of the responsibility for furnishing and installing all fittings required for a complete and proper installation of main as detailed on the plans.
- V.B.2.2. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Full responsibility for the diversion of drainage and

for dewatering of trenches during construction shall be borne by the contractor.

- V.B.2.3. All dirt and other foreign matter shall be removed from the inside of pipe and fittings before they are lowered into the trench. They shall be kept clean during and after laying, care shall be taken to keep dirt out of the jointing space.
- V.B.2.4. Spigot and bells shall be cleaned thoroughly before the application of lubricant and attachment of the gasket shall be in strict accord with the joint.
- V.B.2.5. At the end of each days work, and when pipe laying is discontinued for an appreciable period, open ends of pipe shall be closed with a cast plug or cap firmly secured in place.
- V.B.2.6. Pipe shall not be placed in the trench without excavating for bells so that the entire barrel of the pipe is uniformly supported on the pipe bedding.
- V.B.2.7. Pipe shall be supported to proper line and grade, and secured against upheaval or floating during the placement of bedding.
- V.B.2.8. All pipe and fittings shall be lowered carefully into the trench in such manner as to prevent damage to pipe, fittings, or linings. Neither pipe nor fittings shall be dropped or dumped into the trench.
- V.B.2.9. Cutting of pipe, where needed, shall be done in a neat and workmanlike manner without damage to pipe or pipe lining.
- V.B.2.10. Unless otherwise directed by the BWC, pipe shall be laid with bell ends facing in the direction of laying. For lines on an appreciable slope, bells shall, at the direction of the BWC, face upgrade. Wherever necessary to deflect pipe from a straight line in either the horizontal or vertical plane, to avoid obstructions, or for other allowable reasons, the degree of deflection at any joining shall be not greater than that which will provide adequate gasket space entirely around the spigot end of pipe
- V.B.2.11. Deflections shall not exceed the maximum recommended by the pipe manufacturer.
- V.B.2.12. All non-metallic pipes shall have trace wire meeting requirements of Section IV.O.1, "Detectable Tracer Tape" of these specifications.



V.B.3. Service Lines:

- V.B.3.1. Copper: Trench bottom shall be free from rocks and other sharp objects. The trench shall be five (5) feet deep as a minimum. Copper service line shall be laid from corporation stop to meter location in trench sufficient to clear paving grades. Care shall be exercised to maintain the line free of dirt and foreign mater at all times. Copper line shall be made up in an entirely slack position and shall be free of kinks. Bends shall be no greater than the originally found in the coil of tubing as packaged. For one and one half (1-½”) inch & two (2”) inch copper shipped in straight length, use the following Bend-Criteria. For two (2”) inch copper tubing, a minimum of 45° Bend may be accomplished in a four (4) foot Section. For one and one half (1-½”) inch copper, 45° bend in a three (3) foot section.
- V.B.3.2. Polybutylene (PB): Trench bottom shall be free of rocks or sharp objects and should be compacted to prevent settlement. Depth of Service Line should be five (5) feet unless otherwise specified on plans or directed by the BWC. Before installation, pipe should be inspected for cuts, punctures or excessive abrasion.
- V.B.3.3. Pipe should be blown out before final connections are make to eliminate any dirt or sand that may have entered the pipe during installation. Pipe shall be pressure tested before being fully backfilled, (partial backfill to hold the pipe in place).
- V.B.3.4. Early Warning Tape: Early warning tape shall be installed in trench, eighteen (18”) inches below ground surface for all pipe.

V.C. Fittings:

- V.C.1. Description: This section covers the construction methods for fittings used in water line construction. All materials shall conform to the requirements of Section IV.E – MATERIALS - Fittings. Where mechanical joint fittings are to be used, bolts shall be protected from the concrete blocking by wrapping the fitting with clear plastic.
- V.C.2. Ductile Iron Pipe: Fittings for ductile iron pipe shall meet with the requirements of Section IV.E.2 - “Fittings for Ductile Iron Pipe” of these specifications. Fittings shall be installed as per Section V.E.2 - “Pipe Laying”.
- V.C.3. Polyvinyl Chloride (PVC) Pressure Pipe: Fittings for PVC pressure pipe shall meet with requirements of Section IV.E.2 - “Fittings for PVC

Pressure Pipe” of these specifications. Fittings shall be installed as per Section V.E.2 - “Pipe Laying”.

V.D. Taps:

V.D.1. Service Taps:

V.D.1.1. General: Taps and/or tap assemblies of the specified size shall be installed in locations as detailed and indicated on the plans or as specified.

V.D.1.2. Taps: Taps for transmission of water or air from the main into system service accessories are defined as follows:

V.D.1.2.1. Standard internal pipe threaded holes in the wall of water mains; these taps may be either manufactured into the pipe or installed in the field.

V.D.1.2.2. Tap installations that are made by clamping a bronze service clamp equipped with a sealed threaded port on the periphery of the main then drilling through the pipe wall to complete each service port.

V.D.1.2.3. When a direct tap is made, pipe dope or Teflon tape shall be applied to the threaded part of the corporation stop.

V.D.1.2.4. Services will only be provided from dedicated easements, alleys and right-of-ways.

V.D.1.2.5. BWC shall determine the location of taps.

V.D.1.2.6. Taps will be located in such a manner to provide the shortest distance to the meter.

V.D.1.3. Tapping Asbestos-Cement Pipe: Asbestos-cement pipe shall be tapped by the use of a tapping saddle made of brass or stainless steel as in Section IV.F above.

V.D.1.4. Tapping Cast Iron Pipe: Cast iron pipe four (4) inches in diameter and smaller shall be tapped by the use of a tapping saddle made of brass or stainless steel as in Section IV.F above.

V.D.1.5. Tapping Ductile Iron Pipe: Ductile Iron Pipe shall be tapped the same as cast iron pipe.

V.D.1.6. Tapping PVC Pipe: PVC pipe shall be tapped the same as cast iron pipe.

V.D.2. Main Taps:

V.D.2.1. Wet Taps: Wet connections shall be used for all connections except where directed by the BWC. Wet connections shall be made with a tapping sleeve and valve conforming to Section IV.J – “Tapping Valves and Sleeves” of these specifications, whether air driven or manual tapping machines are used. The pipe to be tapped shall be cleaned thoroughly and wire brushed to remove rust and other foreign matter. The tapping sleeve shall be shut and tightened down securely. The valve shall be put on the sleeve and braced against movement. Then the tap shall be made.

V.D.2.2. Dry Taps: Dry connections shall only be made when directed by the Engineer and/or when a fitting must be added to an existing line. For dry connections the existing line must be shut off and drained. This should be done so that down time of the line shall be as short as possible. After line has been drained, the line shall be cut and the fitting put in and blocked. The section of line cut into shall be tested and sterilized, as would a new line.

V.E. Fire Hydrants:

V.E.1. Description: This section covers construction methods used in setting fire hydrants. All fire hydrants shall conform to Section IV.G - “Fire Hydrants”.

V.E.2. Excavation: Excavation for fire hydrants shall be neat and shall leave back of trench and bottom of trench undisturbed earth for concrete blocking.

V.E.3. Installation: Fire hydrants shall be installed as per standard details. A standard six-inch gate valve shall be between the main and the hydrant, as per standard details. Six (6) inch cast or ductile iron water line, meeting the requirements of these specifications, shall be used to install fire hydrants.

V.E.4. Backfill: Backfill shall be as per standard details. Concrete blocking shall be put underneath and behind hydrant. At least seven (7) cubic feet of crushed stone, average  $\frac{3}{4}$  inch in diameter, shall be placed around hydrant as per standard details for drainage of hydrant barrel.

V.F. Valves:

- V.F.1. Description: This section covers construction methods used for putting in valves. All valves shall conform to Section IV.H - “Valves”.
- V.F.2. Bedding: Valves shall be bedded the same as the pipe on which the valve is installed.
- V.F.3. Backfill: Valves shall be bedded the same as the pipe on which the valve is installed.
- V.F.4. Vertical Valves: Valves shall come with an adjustable cast iron valve box, for vertical valves. Backfill for valves shall be compacted as per Section V.C.1 – “Water Lines”. Valve boxes shall be installed plumb centered on the valve nut and to proposed grade.
- V.F.5. Horizontal Valves: Horizontal valves shall be installed inside a standard water tight precast concrete manhole. All horizontal valves shall have a by-pass valve as per Section IV.H - “Valves” of these specifications. Bypass valves shall be installed as per the plans and specifications and Section V.I.4 - “Vertical Valves” above.
- V.F.6. Air Valves:

V.F.6.1. General: The term Air Release Valve as used in this section shall apply to the installation of both air release valves and combination air and vacuum release valves. Manholes as per standard details shall be furnished as an integral part of either air release valve or combination air and vacuum release valve installations.

V.G. Meters:

- V.G.1. Description: Services will only be provided from dedicated easements, and right-of-ways. The BWC shall determine the location and size of all meters. Meters shall be located in such a manner to provide the shortest length of service line required as long as the main is not overloaded. The meter will not be in a location that will hinder the maintenance or could cause damage to meter.
- V.G.2. Meters and Fittings: Meters shall conform to Section IV.N - “Meters” of these specifications and shall be set by the BWC. Fittings shall conform to Section IV.F - “Brass Stops, Cocks, and Fittings for Water Works Service” of these specifications.

V.H. Pavement Repairs:

- V.H.1. Description: This section covers the construction methods to be used in the repair of roads, streets, or other public rights-of-way.

V.H.2. Permanent Repairs:

- V.H.2.1. Asphaltic concrete hot mix surface course construction shall meet with the current requirements of the Dunstable Board of Road Commissioners or Mass Highway Department. Specifications for the construction of asphaltic concrete hot mix surface course or as otherwise approved.
  - V.H.2.2. Gravel surfacing shall meet with the current requirements of the Dunstable Highway Commission for the construction of crushed stone base courses.
  - V.H.2.3. All permanent repairs of streets, roads, or other public rights-of-way shall meet with the construction requirements of the governing agency or private owner and shall meet with the requirements of all local By-Laws, Regulations, Permits, or Codes governing the repairs to roads, streets, or other rights-of-way.
- V.H.3. Temporary Surfacing: Methods of temporary surfacing shall meet with the requirements of Section V.K.2.2 above or as otherwise approved to adequately maintain traffic and proper drainage.

V.I. Disinfection:

- V.I.1. Description: This section covers methods for disinfection of water lines and facilities. Before water lines are sterilized they must first be pressure tested according to the requirements of Section VI.- TESTING of these specifications. Water lines also must be flushed to remove dirt and other foreign matter.
- V.I.2. Disinfection:
  - V.I.2.1. After satisfactory pressure and leakage tests have been made, before placing the newly laid mains in service, and when directed by the BWC, the Contractor shall disinfect the main by chlorination.
  - V.I.2.2. Prior to chlorination, the mains shall be flushed to remove dirt and other foreign substances.
  - V.I.2.3. The mains shall be disinfected by the Contractor under the supervision of the BWC. The Contractor shall use a manually controlled, vacuum type solution feed chlorinator using a mixture of water and an approved chlorine-bearing compound of known chlorine content, such as calcium hypochlorite. The chlorine shall

be introduced into the main through a  $\frac{3}{4}$  inch corporation stop installed approximately one foot up-stream from the valve at the beginning of the job and shall be tested for residual chlorine at  $\frac{3}{4}$  inch corporation stop installed approximately one foot from the downstream valve at the end of the project.

- V.I.2.4. Water from an approved source shall be introduced slowly into the main during the application of chlorine. The rate of chlorine mixture flow shall be in such proportion to the rate of water entering the pipe that the chlorine dose entering the mains shall be at least 50 parts per million. When the pipeline has been completely filled with treated water, the main shall be sealed off. Treated water shall be retained in the main for a period of at least twenty-four (24) hours. At the end of the retention period, the chlorine residual at the extremities of the pipe and at other representative points shall be at least 5 parts per million.
- V.I.2.5. Should the first treatment fail to meet the above requirements, the procedure shall be repeated until tests show that, in the opinion of the BWC, effective disinfection has been accomplished. The water shall then be flushed from the main and the main filled with potable water from the system.

## **VI. TESTING**

VI.A. General: This part of the specifications stipulates test requirements for materials, construction methods, and leakage, pressure and bacteriological tests of the water lines. Testing for materials and construction methods shall be at the Developer's option except as stipulated herein. The BWC may require tests as outlined in these specifications for materials and construction procedures if, in the opinion of the BWC, the quality of materials and the construction procedures do not meet the requirements stipulated herein.

In all cases, leakage, pressure and bacteriological tests shall be performed on water lines as specified in these standard specifications.

### **VI.B. Testing:**

- VI.B.1. The Contractor shall furnish all labor, pumps, taps, chemicals, and other necessary equipment to conduct hydrostatic pressure tests and measured leakage test; and to disinfect thoroughly the mains laid under this contract in accordance with Section 4 AWWA C600-82- Installation of Ductile Iron Water Main.

VI.B.2. The tests and disinfection shall be conducted at a time specified by and under the supervision and direction of the BWC who shall judge the success or failure of the work to meet the required standards.

VI.B.3. In the event that the work fails to meet the required standards as stated herein, the Contractor shall perform such excavation, repair, relaying of pipe, rechlorinating, and all other work necessary to correct the work; and shall repeat the tests or chlorination as often as may be necessary and until such time as the required standards are met.

VI.C. Pressure Tests:

VI.C.1. Before applying the specified test pressure, all air shall be expelled from the pipe. If suitable means of expelling air are not available at high places, the Contractor shall make all the necessary taps as the BWC may direct. After the tests have been completed, the corporation stops shall be left in place or removed and plugs inserted, as directed by the BWC

VI.C.2. The newly laid pipe shall be tested in valved or plugged sections as determined by the District in the field. Water shall be slowly introduced into the section being tested by means of an approved power-driven high pressure test pump.

VI.C.3. The new laid pipeline shall be tested to a pressure equal to 150% of the maximum static pressure for the section being tested corrected to the elevation of the test gauge. If the static pressure of any newly laid section of pipeline being tested is less than 100 PSIG measured at the lowest point of the pipeline section, then the minimum test pressure shall be 150 PSIG.

VI.C.4. The pressure shall be raised to the test pressure required for each section being tested as determined by the BWC. When the test pressure is reached, the time shall be recorded and the test shall begin. The duration of each pressure test shall be a minimum of two hours. During the test, pressure shall be maintained in the section of pipeline being tested by means of a recirculating bypass type test pump. Water shall be added in measured amounts from a container of known volume if required to maintain pressure. The addition of excessive amounts of water shall constitute immediate test failure. The BWC will approve all gauges and test equipment.

VI.C.5. During the test, the line will be examined by the BWC for visible leaks and breaks. Any defects in the works shall be repaired, and any defective materials shall be removed and replaced by the Contractor as and where directed by the BWC.

#### VI.D. Leakage Test:

VI.D.1. Method of Testing: The leakage test shall be conducted concurrently with the pressure test. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 P.S.I. of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

VI.D.2. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = SD\sqrt{P/133,200}$$

In which L is the allowable leakage, in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

VI.D.3. Allowable leakage at various pressures is shown in the following table;  
Table 2 –Allowable Leakage Rates.

**Table 2 – ALLOWABLE LEAKAGE RATES**

VI.D.4. Allowable Leakage Per 1000 ft. (305 m) of Pipeline “ – gph”\*

VI.D.5.

Avg. Test Pressure psi (Bar)	6	8	10	12	14	16	18	20	24	30	36
450 (31)	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73
400 (28)	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.6	4.5	5.41
350 (24)	0.84	1.12	1.4	1.69	1.97	2025	2.53	2.81	3.37	4.21	5.06
300 (21)	0.78	1.04	1.3	1.56	1.82	2.08	2.34	2.6	3.12	3.9	4.68
275 (19)	0.75	1	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48
250 (17)	0.71	0.95	1.19	1.42	1.66	1.9	2.14	2.37	2.85	3.56	4.27
225 (16)	0.68	0.9	1.13	1.35	1.58	1.8	2.03	2.25	2.7	3.38	4.05
200 (14)	0.64	0.85	1.06	1.28	1.48	1.7	1.91	2.12	2.55	3.19	3.82
175 (12)	0.59	0.8	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58
150 (10)	0.55	0.74	0.92	1.1	1.29	1.47	1.66	1.84	2.21	2.76	3.31
125 (9)	0.5	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02
100 (7)	0.45	0.6	0.75	0.9	1.05	1.2	1.35	1.5	1.8	2.25	2.7

\*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.



- VI.D.6. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/h/in. of nominal valve size shall be allowed.
- VI.D.7. When hydrants are in the test section, the test shall be made against the closed hydrant.
- VI.D.8. Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified, the Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance.
- VI.D.9. All visible leaks are to be repaired regardless of the amount of leakage. At the end of the test periods if the amount of water added to the main from the calibrated vessel is less than the allowable leakage, and if the line shows no visible leaks or other failures, that portion of the main tested will be approved by the BWC.

VI.E. Testing of Valves and Hydrants:

- VI.E.1. All valves and hydrants shall be pressure tested during the main pipeline test. Hydrant gate valves shall remain open during the main pressure test. After the pipeline has been pressure tested and accepted the hydrant gate valve shall be closed and the hydrant valve cracked open to release some pressure on the hydrant side of the gate valve. An acceptable test for each hydrant gate valve shall be no loss of pressure in the main line test pressure as each valve is closed.
- VI.E.2. All main line butterfly or gate valves and control valves on any intersecting side streets shall also be tested by the same procedures outlined above as far as practical. The BWC shall decide if it is impractical to test any one particular valve location. No pressure test shall be considered acceptable until all possible control valves have been tested to insure proper closing and water tightness.
- VI.E.3. The Contractor shall make any taps and furnish all necessary caps, and plugs, as required in conjunction with testing. He shall also furnish a test pump, gauges and any other equipment required in conjunction with carrying on the hydrostatic tests. He shall at all times protect the new water mains and the existing water mains against the entrance of polluting material.

## APPENDIX A

### **SCHEDULE OF RATES AND FEES**